

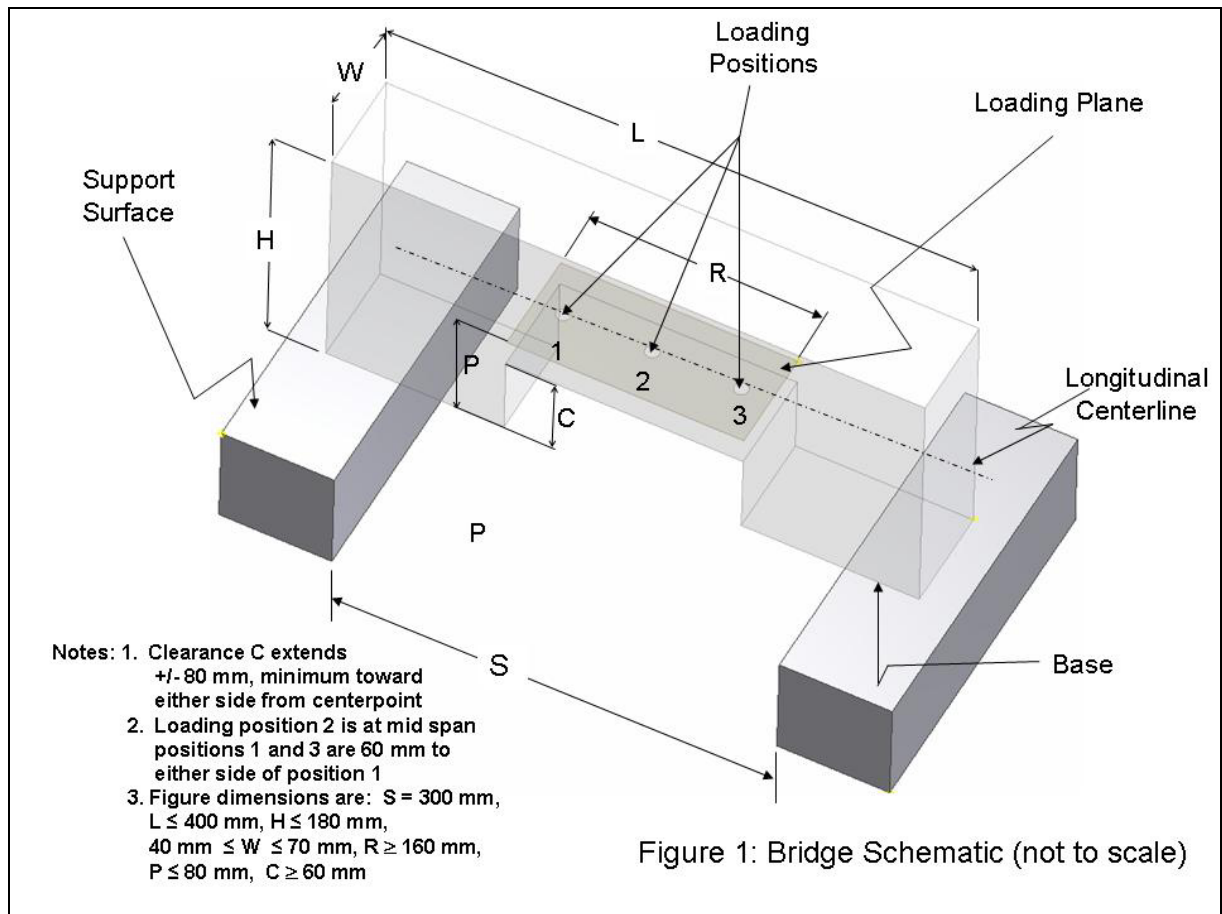
## **2010 BNL MODEL BRIDGE SPECIFICATIONS**

### **1. Materials**

- a. The bridge must be constructed only from 3/32 square cross-section basswood and any commonly available adhesive.
- b. The basswood may be notched, cut, sanded or laminated in any manner.
- c. No other materials may be used. The bridge may not be stained, painted or coated in any fashion with any foreign substance.

### **2. Construction**

- a. The bridge mass shall be no greater than 30.00 grams.
- b. The bridge (see Figure 1) must span a gap (**G**) of 300 mm, be no longer (**L**) than 400 mm, be no taller (**H**) than 180 mm above the support surfaces, and have a width (**W**) between 40 mm and 70 mm. It must have a horizontal loading plane that is a maximum height (**P**) of 80. mm above the support surfaces. The bridge structure may not project below the support surfaces.
- c. The bridge structure shall be symmetrical about its longitudinal and transverse centerlines.
- d. The bridge must be constructed to provide a horizontal support surface for the loading plate and rod at each of the three possible loading positions. These three positions, at the mid-span of the bridge and 60 mm to either side of the center, will be clearly and consecutively labeled "**1, 2, 3**" from either end of the bridge by the participant before submission to the judges (see 3b). The horizontal loading plane must be a minimum length (**R**) of 160. mm and centered on the mid-span of the bridge. The bridge structure must allow the loading rod (see 3a) to be mounted from above or below (See note after 3a) and allow the loading plate to be placed on the loading plane.
- e. The bridge must have a minimum clearance (**C**) of 60. mm in height above the support surfaces. This clearance also extends 80 mm toward either end of the bridge from the center point of the bridge. It coincides with the horizontal loading plane, and lies directly beneath it. No part of the bridge structure may be built around this clearance area, and a 60 mm high, by 160 mm wide block must pass cleanly under the bridge.



### 3. Loading

- a. The load will be applied downward from above by means of a 40 mm square plate resting on the loading plane of the bridge. The plate will be 20 mm thick and will have a 9.53 mm (3/8 inch) rod rigidly attached and extending upward from the center of the 40 mm square plate. The load will be applied through this rod. The sides of the loading plate will be parallel to the longitudinal axis of the bridge.

*(Note: Although BNL will load from above the bridge; the International Contest will load from below by means of the same size plate with the 3/8 inch rod suspended below for the purposes of adding load. Bridge designs that do not have loading rod access from both above and below will be disqualified)*

- b. The three loading positions will be located on the horizontal loading plane. The center loading position (numbered "2") will be located at the center point of the bridge. The other two loading positions (numbered "1" and "3") will be located 60. mm toward either end of the bridge from the center.

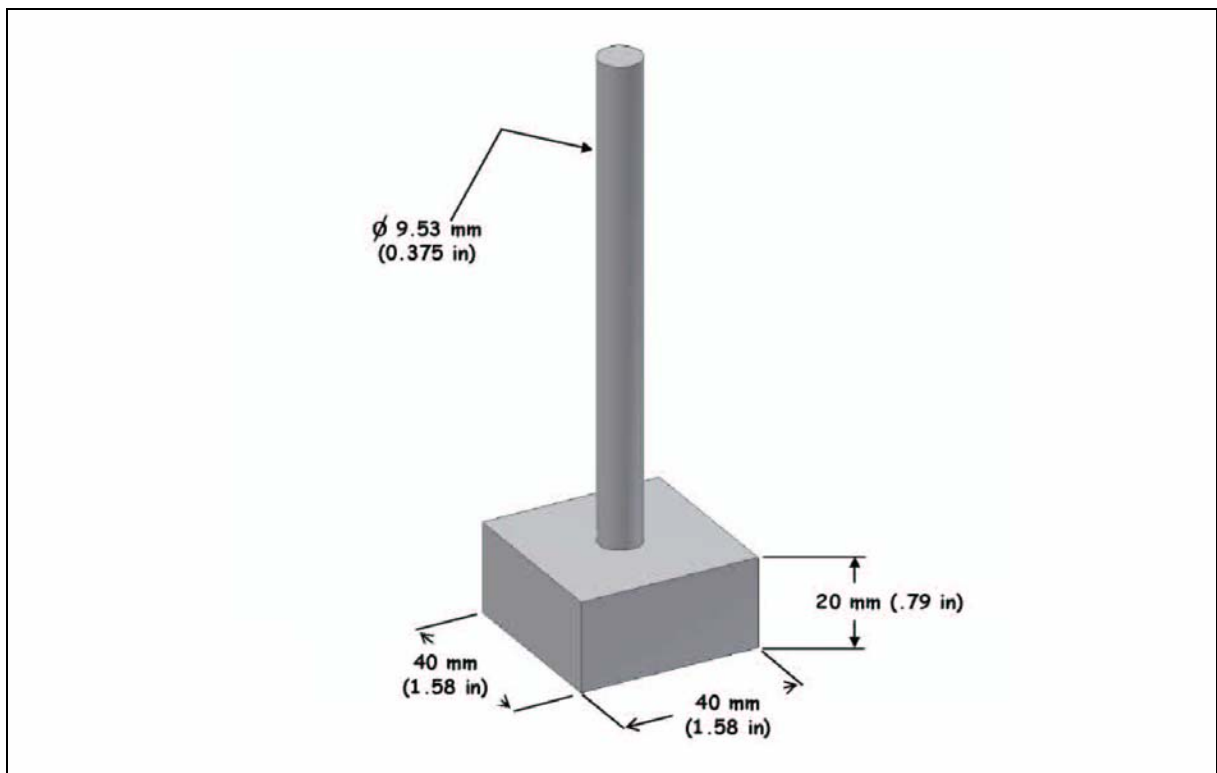
- c. On the day of the competition, the judges will randomly draw the number of the loading position to be used; it will be the same for all bridges tested.

#### 4. Testing

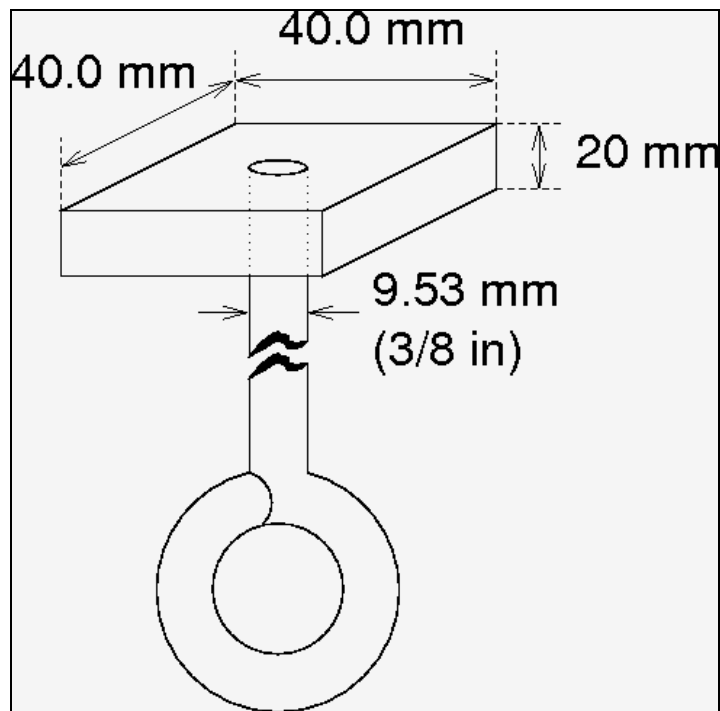
- a. On the day of the contest, judges will center the bridges on the loading surfaces.
- b. The load will be applied from above, as described in section 3, above. Competition loading will stop at 50 kg (~110 lbs). However, loading will continue until bridge failure occurs.
- c. Bridge failure is defined as the inability of the structure to carry additional load or a bridge deflection of 25 mm under the loading location, whichever occurs first.
- d. The bridge with the highest structural efficiency, **E**, will be declared the winner.

$$E = \text{Load supported in grams (50,000 g maximum)} / \text{Mass of bridge in grams}$$

The three bridges with the highest structural efficiencies will be awarded prizes.



**Figure 2: Loading Plate (Not to scale)**



**Figure3: International competition Loading Plate Detail (not to scale). The loading plate is 40 mm square, and 20 mm thick with a clearance hole for a 9.53 mm (3/8 inch) diameter loading rod in the center.**

## 5. Qualification

- a. All construction and material requirements will be checked prior to testing by the judges. Bridges that fail to meet these specifications will be disqualified. Bridges disqualified prior to the start of the contest may be tested as exhibition bridges. The results will be reported to the contestants.
- b. If, during testing, a condition becomes apparent (i.e., use of ineligible materials, inability to support the loading plate, bridge optimized for a single loading point, etc.) which is a violation of the rules or prevents testing as described above in Section 4, that bridge shall be disqualified. If the disqualified bridge can accommodate loading, it may still be tested as an exhibition bridge, as stated above.
- c. For questions on the preceding rules call 631-344-5963 between 9:00am and 4:00pm EST or email Mel Morris at: [mmorris@bnl.gov](mailto:mmorris@bnl.gov)
- d. For rule updates, periodically check the BNL web site:  
<http://www.bnl.gov/education/contests/bridge>
- e. All decisions of the judges are final.